The teaching of division in Chaddlewood Primary School

This calculation policy outlines the progression in mathematical strategies and skills from Foundation to Year 6, and the typical year group children will be in when they are first introduced to particular concepts. This calculation policy is to be used flexibly, as children in each year group may draw from year groups above and below their own, according to their ability.

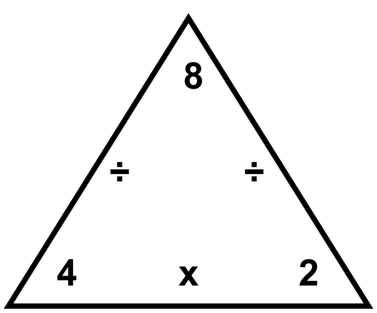
It is essential that, in all year groups, division is:
- taught alongside its inverse multiplication, as these important links will assist children in mastering the operation.
- involved in situations with rich problem solving activities and word problems.
- approached in a cross curricular manner wherever possible.

6 ÷ 3 = 2
6 ÷ 2 = 3
2 x 3 = 6
3 x 2 = 6

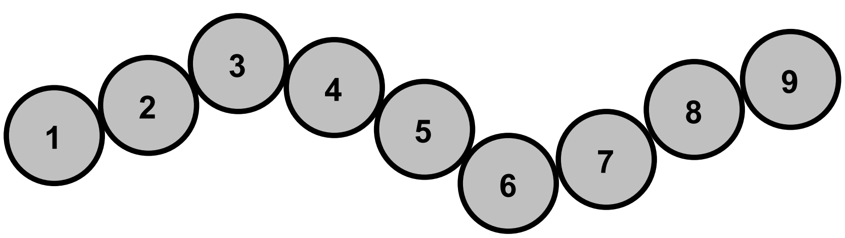
Children will be given many different types of problems, often which will look very different to what they are used to. This is true for all of the mathematical strategies throughout the calculation policy. For example, in calculating problems involving a missing number (for example 12 ÷ 3 = □), children will also consider:

□ ÷ 3 = 4 12 – □ = 4 3 = 12 ÷ □ 4 = □ ÷ 3.

To help to develop the links between multiplication and division the children will also use 'number trios'. Number trios demonstrate to the children that when they choose a 'trio', they can make four number sentences with them, by covering up particular numbers. These will be used even further by considering what would happen if we multiplied or divided each of the numbers by 10 or 100.



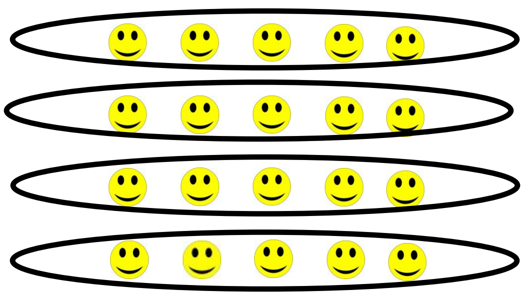
2 x 4 = 8
4 x 2 = 8
8 ÷ 4 = 2
8 ÷ 2 = 4

Strategy	*Rationale*
Practical experience of 'sharing' ***Example*** 10 fat sausages sizzling in a pan. (Encourages counting back in 2s)  ***Example*** Putting objects into pairs. 	Although division is not formally introduced until year 2 the ground work is laid as early as the foundation stage. This includes songs that encourage jumping in equal amounts. The children will also share out toys, fruit and other materials in context. It is important that children have the opportunity to count repeatedly in groups of the same size.
Counting on in 'groups' ***Example*** Can you jump in 2s along the number track? Will you land on 7? Why not?  	Division is known as 'repeated subtraction' and it is also the opposite (inverse) of multiplication. The children will be encouraged to count forwards and backwards in 2s, 3s, 5s and 10s.

‘Groups’

Example

20 ÷ 5 = ☐
20 children get in to teams of 5 to play a game.
How many teams are there?



There will be 4 teams.

Giving visual images for division is important.

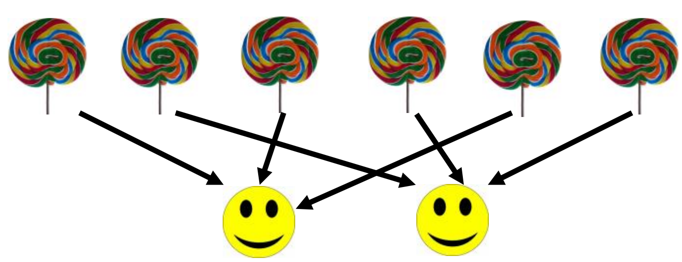
Grouping involves the children taking a larger quantity and grouping them using a particular number (the divisor).

Children are encouraged to draw simple illustrations (referred to as ‘jottings’) in order to help them with problems, where they have not been supplied with a picture.

‘Sharing’

Example

6 ÷ 2 = ☐
6 lollies are shared between 2 children.
How many lollies does each child get?



Sharing involves the children physically sharing objects (often sharing one object at a time, but this is then extended to larger amounts).

If 6 ÷ 2 = ☐ was solved by ‘grouping’ the children would think about how many groups of two there would be in 6, rather than how many each person would get.

Hundred squares

Children will count on in different amounts on a hundred square, identifying patterns, and answer questions associated with it.

Example

How many 5s are in 20?

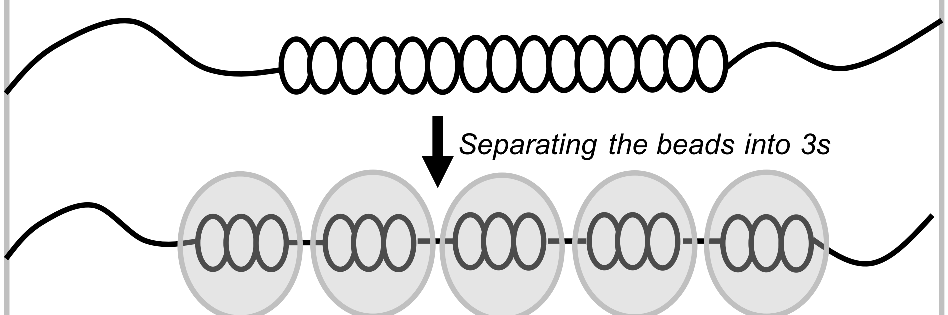
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Children will initially use a hundred square to explore patterns involved in counting up in 2s, 5s and 10s.

More grouping using bead strings

Example

How many 3s are in 15?



There are 5 groups of 3 in 15.

Initially sharing is a powerful image for the children to use. However, when numbers increase this can no longer be carried out practically.

It is important that when grouping is used the children make links with counting in groups using a number line.

The children are also encouraged to count up using multiplication facts (repeated addition)

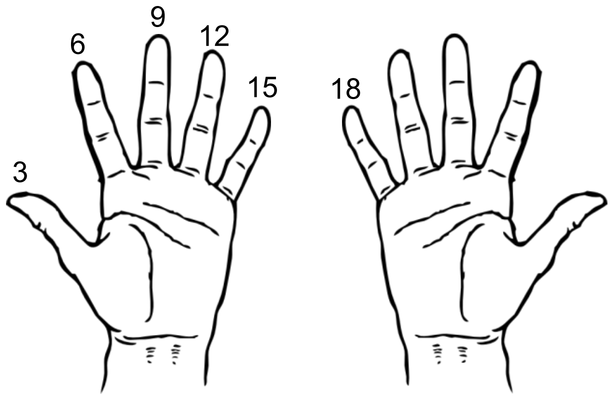
As confidence grows the children use facts to find ‘missing numbers’.

Using fingers

Children count up in an amount equal to the divisor, using their fingers to help them.

Example

How many 3s are in 18?



There are six 3s in 18 (since I used six fingers)

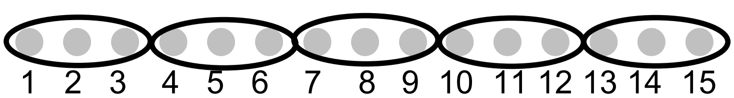
Using marked number lines

The children will combine their understanding of groupings and arrays to form an understanding of how they can use number lines to repeatedly add the divisor (and therefore find how many groups can be made).

Example

How many 3s are in 15?

15 ÷ 3 = ☐

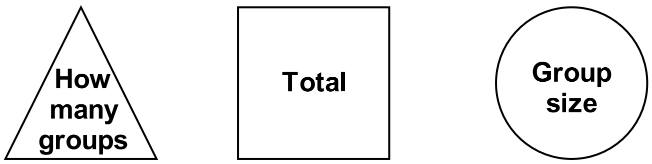


It is important that children can make a link between grouping and jumping on a number line.

The children will also need to understand the link between division and multiplication; they are exact opposites (the 'inverse' of each other).

Vocabulary associated with division

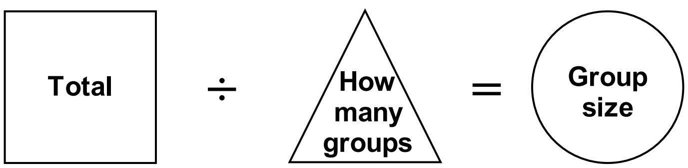
The children will be introduced to the following signs.



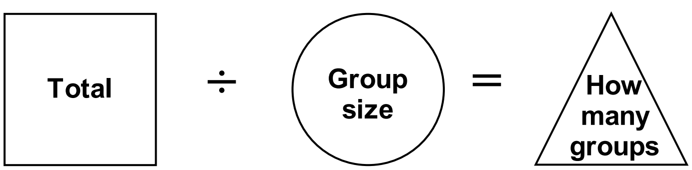
(green triangle, red square, blue circle)

These symbols will be used to showcase the necessary importance upon each of the digits in a number sentence. They will also be manipulated to show the llack of commutativity of division, and how division relates to multiplication.

Furthermore, they will be used to identify the difference between ‘sharing’ and grouping’.



(sharing)



(grouping)

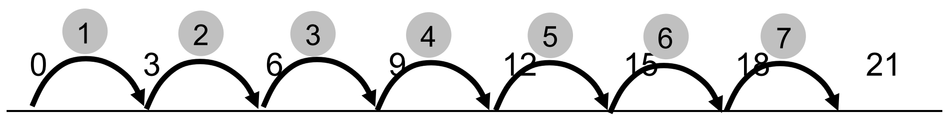
These symbols will be particularly emphasized in Years 2 3 and 4 as the children build upon their multiplication and division knowledge.

Using blank number lines

Using a number line the children will count on in an amount equal to the divisor.
They will then count how many ‘jumps’ they made.

Example

How many 3s are in 21?



There are seven 3s in 21 (because I had to jump seven times)

Fractions

Children will look at relationships of fractions,
finding halves and quarters of numbers.

Example

What is ½ of 6?

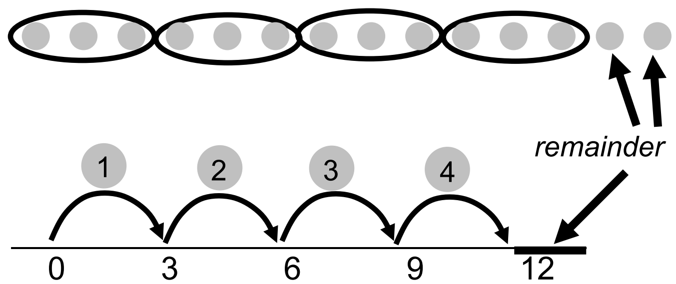
What is ¼ of 12?

Using number lines to find remainders (1)

Children will learn how they can identify if a solution has a remainder and, if it has, what they need to do with this remainder.

Example

14 ÷ 3 = 4 remainder 2



Example

A box can hold 4 Cola bottles.

How many boxes can I fill if I have 14 bottles?

Here the answer needs to be **rounded down**.

Example

A box can hold 4 Cola bottles.

How many boxes will I need for 14 bottles?

Here the answer needs to be **rounded up**.

Children will use the language of ‘remainder’.

Grouping objects and drawing number lines gives a good visual understanding of remainders.

Children will become familiar with interpreting the remainders, when faced with ‘real life’ problems.

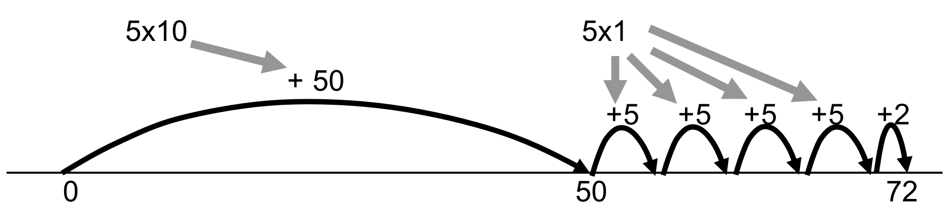
Instead of writing ‘remainder’, children may also abbreviate this and write ‘r.’

Using number lines to find remainders (2)

Children will at this stage begin to make larger jumps using a number line. They will jump in ‘lots of’ a number, rather than smaller amounts each time.

Example

72 ÷ 5 = ☐



so 72÷ 5 = 14 r. 2

This method is more efficient than the one above, as jumping in ‘chunks’ results in fewer steps in the calculation.

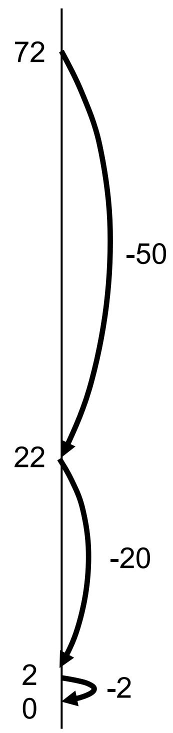
Children can jump in either way on the number line (and not just jumping on as in the example). This is generally called the ‘chunking method’.

More formal methods

Using a similar method to above, the number line is now rotated so that it is vertical. This emphasises to the children how ‘chunks’ of a number can be repeatedly subtracted from the starting number until 0 (or close to 0) Is reached.

Example

72 ÷ 5 = ☐



Children will be encouraged to write down jottings as the calculations get more complex (normally the first few multiples)

5
10
15
20
25
30
35
40
45
50

7 2	
- 5 0	(10 lots of 5)
2 2	(22 left)
- 2 0	(4 lots of 5)
2	(2 remainders)

so there are 14 lots of 5, with 2 remainders.

When secure with number lines and ‘chunking’ the children will begin to use a more efficient way of recording alongside the number line.

Turning the number line vertically helps the children to visualise what is happening.

More interpreting remainders

Children will use a calculator to solve more complex division problems, interpreting the remainders within the solution.

Example

Cub scouts can sleep 6 to a tent. How many tens will be needed if 75 cub scouts are going camping?

Using a calculator to derive the answer gives on the display 12.5

Is the answer 12, 12.5 or 13?

Calculators are introduced as a way of solving division problems. However, the children need to interpret the displays carefully.

This builds upon the ‘Use number lines to find remainders’ method above.

Division of larger numbers

Children will continue to develop their ability to divide larger numbers. Using jottings to support them, they will move from subtracting a few ‘chunks’ of a number, to several ‘tens’ of the divisor.

Example

977 ÷ 36 = ☐

```
36 ) 977
    - 720     (36x20)
      ---
      257
    - 180     (36x5)
      ---
       77
    -  72     (36x2)
      ---
        5
```

36x2 = 72
36x5 = 180
36x10 = 360
36x20 = 720
36x30 = 1080

977 ÷ 36 = 27 r.5

When using larger numbers the children will be encouraged to write down useful multiplication facts first so that they can use these in their calculations.

Sometimes a remainder can be shown as a fraction. For example: 19 ÷ 4 = 4 r 3 or 4 ¾. The fraction is made from the remainder divided by the divisor.

Division of larger numbers with decimals

The above method will then be built upon, but this time using decimals numbers. Children will include a decimal point throughout the working, maintaining the place value of each of the digits.

Example

87.5 ÷ 7 = ☐

$$
\begin{array}{rrl}
7 \,\big) & 8\,7.5 & \\
 & -\ 7\,0.0 & (7\text{x}10) \\ \hline
 & 1\,7.5 & \\
 & -\ 1\,4.0 & (7\text{x}2) \\ \hline
 & 3.5 & \\
 & -\ \ 3.5 & (7\text{x}0.5) \\ \hline
 & 0 &
\end{array}
$$

7x2 = 14
7x5 = 35
7x10 = 70
7x20 = 140

87.5 ÷ 7 = 12.5

When faced with a decimal number the children should be able to use related facts to help them to handle the decimals. For example, if 7 x 5 = 35, then 7 x 0.5 = 3.5 Alternatively the number can be multiplied by 10 or 100 to make it a whole number (no decimals). It can then be divided as before. Finally the answer must be divided by 10 or 100 (depending on what you multiplied by)

The ‘Bus Shelter’ method (1)

As the children start to use more complex methods, these continue to be supported by jottings. A more formal method of vertical chunking without a number line will be introduced.

Example

356 ÷ 8 = ☐

$$\begin{array}{r} 0 \\ 8\,\overline{)\,3\,5\,6} \end{array}$$

How many 800s are in 300? (0)

$$\begin{array}{r} 0 \\ 8\,\overline{)\,3\,{}^{3}5\,6} \end{array}$$

The 300 is therefore place into the tens column.

$$\begin{array}{r} 0\,4 \\ 8\,\overline{)\,3\,{}^{3}5\,6} \end{array}$$

How many 80s are in 350? (4)

$$\begin{array}{r} 0\,4 \\ 8\,\overline{)\,3\,{}^{3}5\,{}^{3}6} \end{array}$$

The remaining 30 is placed in the units column.

$$\begin{array}{r} 0\,4\,4\text{ r.}4 \\ 8\,\overline{)\,3\,{}^{3}5\,{}^{3}6} \end{array}$$

How many 8s are in 36? (4) How many remainders?

356 ÷ 8 = 44 r. 4

Children will be encouraged to check their answers by carrying out the inverse of the operation wherever necessary

This method can not always be used, and therefore children may need to rely upon earlier strategies. For example, this method can not be used to calculate 56 ÷ 6.

Children will still need to make jottings to support them with this method.

The ‘Bus Shelter’ method (2)

Children will then extend upon this method using a two / three digit divisor, using jottings once again to support them in this.